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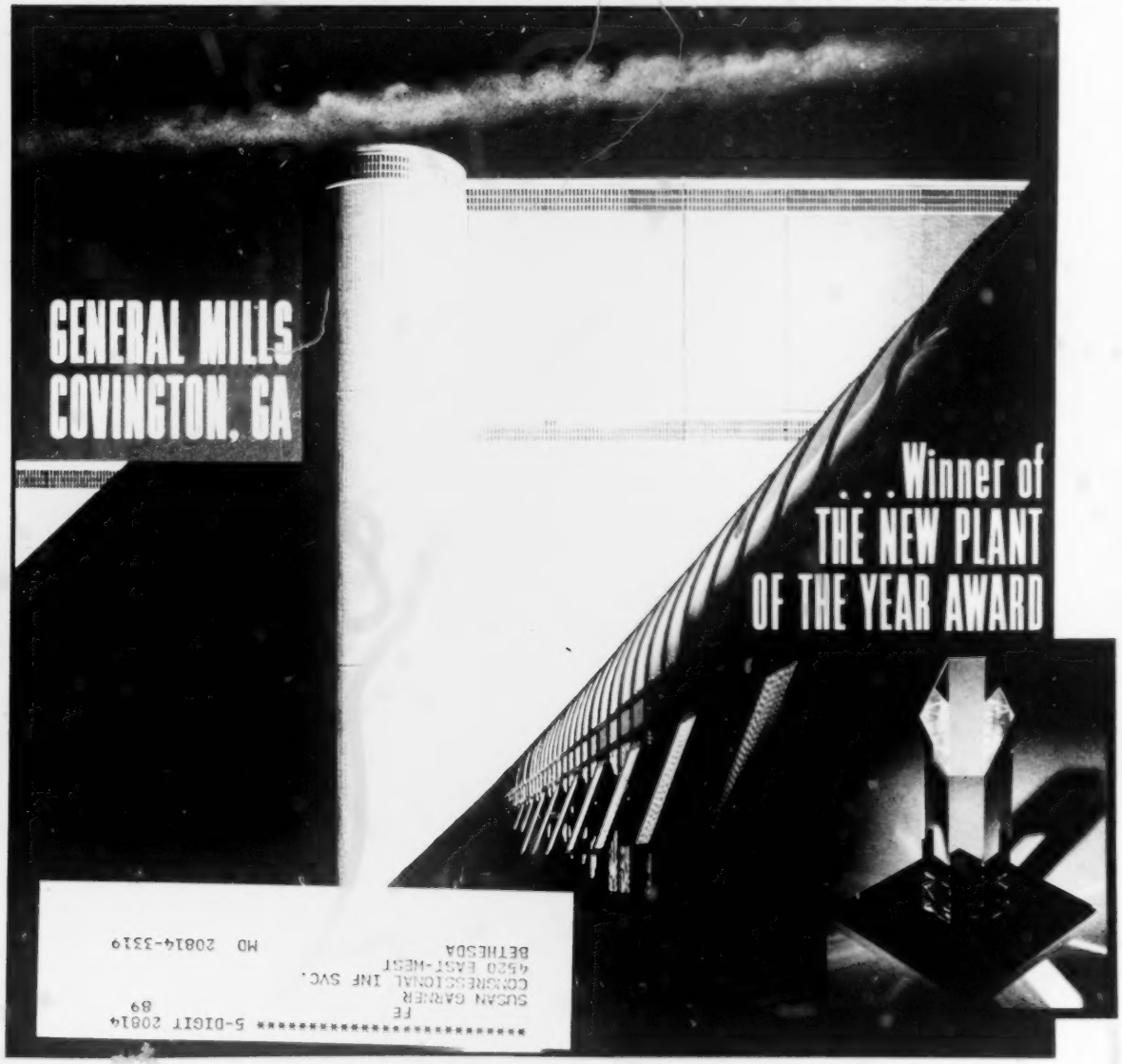

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As the result of an industry-wide competition, the General Mills, Covington, GA facility has been selected New Plant of the Year. The award will be presented by FE at the Food Plants '91 conference in October.
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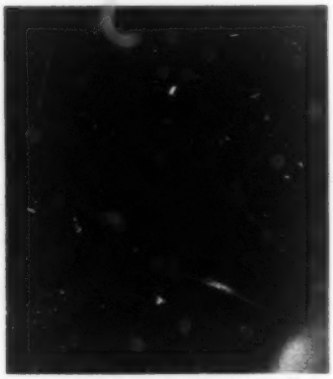

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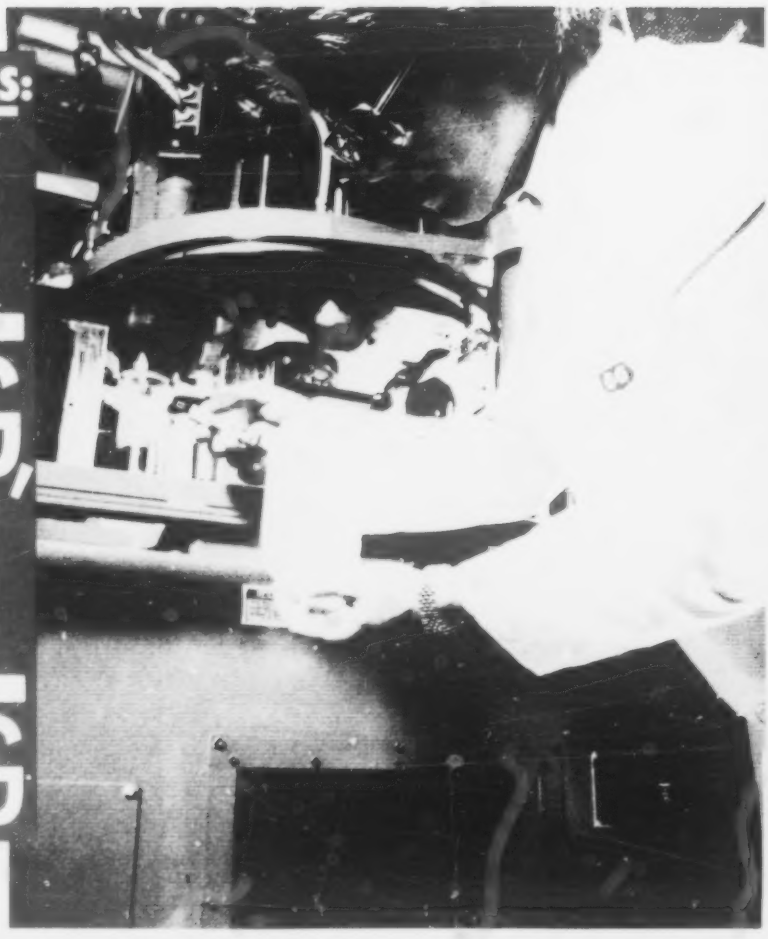
PACKAGING PLASTICS: STILL EXCITING, STILL GROWING



The use of plastics for food packaging continues to grow as it provides the convenience demanded by today's consumers.

MARGIE J. RUSSELL
TECHNICAL EDITOR

Like many lines uttered in movies, it became a classic. Ever since the guy in the movie *The Graduate* told Dustin Hoffman the entire world of future would become engrossed in "plastics"—this wonder material took off in popularity and uses in record numbers. And indeed, for the food packaging industry, this observation has proven to be prophetic. The future, despite mounting environmental pressures, continues to be plastics because, quite simply, they have provided more excitement, more technological challenges, and more diversity than any other material used in the packaging sector.

Microwavability, portability, light weight, shatter resistance, and ease-of-use are only a few of the benefits plastics have brought to a nation of whimsical consumers over the past decade. But how important are plastics to food packaging *now*? "Very important," says Dave Gosper, vice president, general manager-North

A new grade of Marlex polypropylene, BP571, from Phillips 66 has a 10 percent increase in clarity over similar materials. (Source: Phillips 66 Company.)

American Films, Mobil Chemical Company, Pittsfield, NY, "because they provide the most vital benefit of all—convenience. There is no question that plastic is the most efficient way to provide convenience and at the same time protect the product."

Developments and markets

Currently, there are several exciting areas in plastics developments for the food industry, the foremost being improvements in barrier properties in many substrates used for food packaging. A top priority for resin companies, film suppliers, and down-the-line converters is to make their plastic materials less permeable to water and oxygen. Their customers want to maintain the shelf life of their products and keep those products in the same condition as the day they were manufactured and packaged.

There is development work going on which is attempting to combine barrier polymers and newer scavenger technologies, thus ensuring even longer shelf lives for certain products. Predictions indicate that a faster penetration of plastics into the food segment will occur when these material combinations are perfected.

Improvements in physical properties and clarity are continuously being worked on as well, which will allow downgauging, leading to more cost effective packages. Clarity will provide additional opportunities for conversion. Improvements in overall process control for converting and extrusion equipment will also provide additional efficiencies.

Another developing area in the plastics sector is the expansion of the use of polyesters beyond the beverage market. Polyesters had been used in some other markets a few years ago with minimal success but now with improvements and further development, they will be used in a number of new applications such as hot fill.

So, where are all these developments headed? Are the markets for plastics still growing? "Right now, I believe the strongest growth area in plastics for food packaging is flexible packaging," said Ronald H. Foster, technical development manager, EVAL Company of America, Lisle, IL. "This is especially true in multilayer packaging. The foodservice area in particular appears to be very receptive to change from traditional forms of packaging. The desire for more natural foods has increased the demand for more flavor and aroma barrier packaging."

The overall market for multilayer barrier packages in food applications is still growing. The industry is currently not seeing the 20-plus percent growth that was seen in the late 1980s, but the market is experiencing a 10-12 percent growth which is expected to continue through 1995.

The total flexible packaging market in North America for oriented polypropylene (OPP) is placed at 500 million pounds, according to Mobil Chemical Company. The OPP segment is seeing seven to eight percent growth per year. And within the OPP segment, snack applications head the list at six percent, followed by cookie applications (3-4 percent), confections (3 percent), and bakery (2-3 percent). The OPP market is growing faster than the total market for flexible packaging because of the market's continued efforts in paper replacement, material improvements, and aluminum foil replacement. And the flexible segment may be a trendsetter, too, as plastic-to-plastic conversions might occur here. Manufacturers may go from rigid to flexible as a prime example of source reduction for some of their products.

Unfortunately, there are not many "truly new" markets left in food packaging, so it is more of a necessity to have a cooperative effort among the food processor, the raw material supplier and the converter in order to bring new products to the market.

One product new to the arena is currently in test market in Kansas City, MO, a line of cheese sauce dips from Frito Lay. The microwaveable dips are packaged in thermoformed hot fill tubs using Du Pont Company's *Selar OH MFE* ethylene vinyl alcohol

A new hot fill tub using Du Pont's Selar OH MFE barrier resin is currently in test market in Kansas City, MO. (Source: Du Pont Company.)

FDA's perspective of regulations for food packaging

A substance is a food additive, as mandated by the U.S. Food, Drug, and Cosmetic Act, if its intended use "results or may reasonably be expected to result, directly or indirectly, in its becoming a component or otherwise affecting the characteristics of any food." Food packaging materials are considered indirect food additives and are subject to regulation.

The permitted conditions of use for the additive, which are stipulated in the U.S. Code of Federal Regulations, may include temperature, types of food, use level in the plastic, and whether the food contact will be one-time or repeated. Each of these parameters affects the level of migration and the potential human exposure to the additive. By stipulating the permitted use conditions, the regulation is prescribing the level of exposure to the additive which has been determined to be safe.

We must now examine a significant principle inherent in the regulations for indirect food additives when considering the use of recycled materials in packaging. These regulations assume that food packaging materials are made from a controlled source. There is a regulation in 21 CFR Part 176 which covers paper and paperboard which addresses the use of other than virgin materials in the manufacture of paper food contact articles. The regulation provides for the use of both industrial waste from the manufacture of paper and paperboard as well as salvage from used materials provided that neither "bears or contains any poisonous or deleterious substance which is retained in the recovered pulp and that migrates to the food..." However, Part 177, which covers polymeric materials, has no comparable regulation.

The fact that the regulations for food contact plastics do not include any specific authorization for the use of recycled materials should not be interpreted to mean that FDA intends to prohibit their use. The explanation for the absence of a regulation addressing this matter is two-fold: 1) FDA did not anticipate this technology when the regulations in Part 177 were being written, and 2) no one petitioned the Agency to establish such a regulation.

While FDA does not intend to prohibit recycled material for use in food-contact applications, the Agency has the same responsibility vis-a-vis this technology as it does with any other: to ensure the safety of the U.S. food supply. FDA intends to publish regulations that will establish the requirements for the use of recycled plastics in contact with food and develop protocols for industry to use in order to demonstrate that a particular recycled material is of suitable purity for food-contact use.

The agency's protocol will call for model contamination studies with a representative group of contaminants of different polarities, volatilities and permeabilities to the polymer. The aim of the studies will be to demonstrate that the recycling process is capable of removing all but insignificant levels of the matrix of model contaminants.

As a general rule, the level of contamination of recycled material which will be considered to be insignificant will be that which corresponds to a dietary exposure no greater than 0.5 to 1.0 ppb. Because the definition of insignificant will be given in terms of dietary exposure, one considers both migration levels and the fraction of the diet packaged in that particular material (the so-called consumption factor). Consequently, for materials like polyolefins, the maximum acceptable contaminant residue level in the recycled polymer will be lower than that for materials like PET or PVC which have lower consumption factors.

Condensed from a talk by Dr. Patricia S. Schwartz, Division of Food Chemistry and Technology, Food and Drug Administration, Washington, DC, presented at FoodPlas '91, Orlando, FL.

EVOH barrier resin. The seven-layer shelf stable tubs are manufactured by Rampart Packaging (Williamsburg, VA) and consist of polypropylene as the structural material. The Selar OH resin provides a high oxygen barrier ensuring product freshness.

A significant development in the flexible sector is a high barrier polyvinylidene chloride (PVDC) coated OPP film from Mobil Chemical Company, *70HBS*. This entry, whose main application is found in the snack food arena, consists of a PVDC coating on a layer of biaxially oriented polypropylene (BOPP) and a broad heat seal range layer. The film provides excellent moisture and oxygen barrier and can be lap sealed without a thermal stripe to coextruded polypropylene film. The film's properties have been quite advantageous to The Bachman Company, a snack food manufacturer in Reading, PA, which has seen waste reduction and improved productivity on its lines by using the film.

Currently only available in developmental quantities is Phillips 66's new *Marlex BP571* polypropylene, a clarified 25-melt flow homopolymer

	1988	1989	1990E
Gross national product ($ in trillions)	$4.9	$5.2	$5.5
Percent packaging	1.6	1.6	1.6
Packaging ($ in billions)	$77.5	$84.0	$89.0
Percent glass	5.7	5.4	5.3
Percent metal	13.7	13.3	13.7
Percent plastic	4.0	4.4	4.2
Glass containers:			
Volume (million gross)	280.6	284.0	286.8
Value ($ in billions)	$4.4	$4.5	$4.7
Metal containers:			
Volume (billion cans)	114.1	120.0	126.3
Value ($ in billions)	$10.6	$11.2	$12.2
Plastic containers:			
Volume (billion units)	34.5	35.7	38.2
Value ($ in billions)	$3.1	$3.7	$3.7

Source: Prescott, Ball & Turben and Packaging Strategies, Inc.

The Bachman Company now uses a one side heat sealable, polyvinylidene chloride coated OPP for packaging several of its snack products. (Source: Mobil Chemical Company.)

which could eventually replace glass in some applications. The material was designed for use in injection-stretch blow molded food containers such as jars for salsa, dry foods, peanut butter, and juices. Transparent containers can also be made with less material using BP571, which has a melt temperature of 390°F to 427°F. And according to the company, the material has a faster cycle time than traditional polypropylene.

Despite all the wondrous achievements plastics have given to the packaging industry over the years, they are, unfortunately, not without some problems. During the 1980s, a number of special interest groups and legislative bodies decided that plastics were the primary cause of the solid waste disposal problem in the U.S. and began a campaign to restrict or ban their use in many areas. In particular, multilayer and flexible packages have been targeted as being the worst culprits in the disposal system.

It has been said that the best defense is a good offense, which the packaging industry is now using in pointing out the advantages of plastics packaging. However, as some analysts suggest, a return to monolayer struc-

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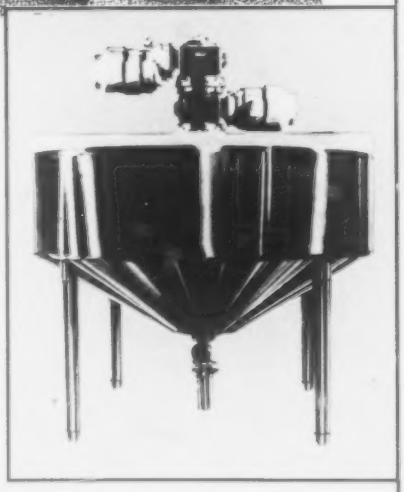

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tures is not the solution. "I do not believe that monolayer containers are the answer to recycling and waste problems," said EVALCA's Ron Foster. "A lot of work has been done to show the recyclability of multilayer, multimaterial plastic packages. Until collection systems and end use markets for recycled materials are developed, the recycling of plastic packages will not increase."

The current dilemma for the industry now is the issue of using recycled materials in food packages. The FDA requires that all materials in contact with a food product be "pure" and the agency is working with the industry to develop guidelines. (See box story.)

Scott Fritschel is the Environmental Programs manager with Du Pont Company in Wilmington, DE and believes "we will see recycled materials in food packaging in the future but we must keep the market segmented."

He goes on to explain that recycled materials will probably not be able to be used in retort plastic containers but could be more readily used for a container for dried products such as rice, which is usually washed before cooking. "We must also consider chemical recycling," he adds, "which is the breakdown of polymers into their component parts. The methanolysis method being developed by several suppliers for polyester will open this door further and we may then be able to use polymers as a renewable resource when the process gets perfected."

Although 20 years ago plastics were viewed as a somewhat "novel" material for food packaging, they are considered the norm now for most products. Since they provide the ability to tailor a package for specific requirements, they are still the best material to respond to these requirements. This is partly why plastics for food packaging has not peaked: their properties continue to evolve and have become vital to many package structures. Their growth will be driven by the developments of manufacturers and the requests by consumers for more convenience and variety. ▲